

I claim:

1. A composition for cleaning microelectronic substrates comprising the following components:
  - (a) a nucleophilic amine,
  - (b) a moderate to weak acid having a strength expressed as a "pKa " for the dissociation constant in aqueous solution of from about 1.2 to about 8,
  - (c) a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether, and
  - (d) an organic co-solvent,and the weak acid component (b) is present in the composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and the pH of the composition is from about pH 4.5 to 9.5.
2. A composition according to claim 1 comprising from about 1% to about 50% component (a), from about 10% to about 80% of component (c), and from about 20% to about 80% component (d), the percentages being weight % based on the total weight of the composition.
3. A composition according to claim 1 wherein the nucleophilic amine component is at least one amine selected from the group consisting of 1-amino-2-propanol, 2-(2-aminoethoxy)ethanol, 2-aminoethanol, 2-(2-aminoethylamino)ethanol, 2-(2-aminoethylamino)ethylamine, diethanolamine and triethanolamine.
4. A composition according to claim 1 wherein component (c) is at least one compound selected from the group consisting of isopropanol, butanol, ethylene glycol, diethylene glycol, triethylene glycol, polyethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, 1,3-propanediol,

2-methyl-1,3-propanediol, 2-butene-1,4-diol, 2-methyl-2,4-pentanediol, hexanediol, glycerol, ethylene glycol monomethyl ether diethylene glycol monomethyl ether, propylene glycol dimethyl ether, and 2-(2-butoxyethoxy)-ethanol.

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5. A composition according to claim 1 wherein the organic co-solvent is a co-solvent having a solubility parameter of from about 8 to about 15.
6. A composition according to claim 5 wherein the co-solvent is at least one  
10 compound selected from the group consisting of 2-pyrrolidinone, 1-methyl-2-pyrrolidinone, 1-ethyl-2-pyrrolidinone, 1-propyl-2-pyrrolidinone, 1-hydroxyethyl-2-pyrrolidinone, a dialkyl sulfone, dimethyl sulfoxide, a tetrahydrothiophene-1,1-dioxide, dimethylacetamide and dimethylformamide.
- 15 7. A composition according to Claim 6 wherein the solvent is selected from the group consisting of sulfolane and 1-methyl-2-pyrrolidinone, the nucleophilic amine is selected from the group consisting of monoethanolamine and 1-amino-2-propanol, component (c) is selected from the group consisting of ethylene glycol, propylene glycol, 2-methyl-2,4-pentanediol, glycerol, 2-butene-1,diol, isopropanol and 2-(2-butoxyethoxy)ethanol.  
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8. A composition according to claim 1 wherein the acid component (b) is at least one acid having a pKa value of from 2 to 5.
- 25 9. A composition according to claim 7 wherein the acid component (b) is at least one acid having a pKa value of from 2 to 5.
10. A composition according to claim 1 wherein component (b) comprises at least one acid selected from the group consisting of acetic acid, propanoic acid,  
30 malonic acid, phenylacetic acid and hypophosphorus acid.

11. A composition according to claim 7 wherein component (b) comprises at least one acid selected from the group consisting of acetic acid, propanoic acid, malonic acid, phenylacetic acid and hypophosphorus acid.
12. A composition according to claim 1 wherein the nucleophilic amine comprises monoethanolamine, the co-solvent comprises 1-methyl-2-pyrrolidinone, the compound of component (c) is ethylene glycol and the acid of component (b) is acetic acid.
13. A process for cleaning a microelectronic substrate without producing any substantial metal corrosion, the substrate containing photoresist polymeric material and a metal, the process comprising contacting the substrate with a cleaning composition for a time sufficient to clean the substrate, wherein the cleaning composition comprises:
  - (a) a nucleophilic amine,
  - (b) a moderate to weak acid having a strength expressed as a "pKa" for the dissociation constant in aqueous solution of from about 1.2 to about 8,
  - (c) a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether, and
  - (d) an organic co-solvent,and the weak acid component (b) is present in the cleaning composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and the pH of the composition is from about pH 4.5 to 9.5.
14. A process according to claim 13 wherein the cleaning composition comprises from about 1% to about 50% component (a), from about 10% to about 80% of component (c), and from about 20% to about 80% component (d), the percentages being weight % based on the total weight the composition.

15. A process according to claim 13 wherein the nucleophilic amine component is at least one amine selected from the group consisting of 1-amino-2-propanol, 2-(2-aminoethoxy)ethanol, 2-aminoethanol, 2-(2-aminoethylamino)ethanol, 2-(2-aminoethylamino)ethylamine, diethanolamine and triethanolamine.  
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16. A process according to claim 13 wherein component (c) is at least one compound selected from the group consisting of isopropanol, butanol, ethylene glycol, diethylene glycol, triethylene glycol, polyethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, 1,3-propanediol, 2-methyl-1,3-propanediol, 2-butene-1,4-diol, 2-methyl-2,4-pentanediol, hexanediol, glycerol, ethylene glycol monomethyl ether diethylene glycol monomethyl ether, propylene glycol dimethyl ether, and 2-(2-butoxyethoxy)-ethanol.  
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17. A process according to claim 13 wherein the organic co-solvent is a co-solvent having a solubility parameter of from about 8 to about 15.  
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18. A process according to claim 17 wherein the co-solvent is at least one compound selected from the group consisting of 2-pyrrolidinone, 1-methyl-2-pyrrolidinone, 1-ethyl-2-pyrrolidinone, 1-propyl-2-pyrrolidinone, 1-hydroxyethyl-2-pyrrolidinone, a dialkyl sulfone, dimethyl sulfoxide, a tetrahydrothiophene-1,1-dioxide, dimethylacetamide and dimethylformamide.  
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19. A process according to Claim 18 wherein the solvent is selected from the group consisting of sulfolane and 1-methyl-2-pyrrolidinone, the nucleophilic amine is selected from the group consisting of monoethanolamine and 1-amino-2-propanol, component (c) is selected from the group consisting of ethylene glycol, propylene glycol, 2-methyl-2,4-pentanediol, glycerol, 2-butene-1,diol, isopropanol and 2-(2-butoxyethoxy)ethanol.  
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20. A process according to claim 13 wherein the acid component (b) is at least one acid having a pKa value of from 2 to 5.
- 5 21. A process according to claim 19 wherein the acid component (b) is at least one acid having a pKa value of from v 2 to 5.
22. A process according to claim 13 wherein component (b) comprises at least one acid selected from the group consisting of acetic acid, propanoic acid,  
10 malonic acid, phenylacetic acid and hypophosphorus acid.
23. A process according to claim 19 wherein component (b) comprises at least one acid selected from the group consisting of acetic acid, propanoic acid, malonic acid, phenylacetic acid and hypophosphorus acid.
- 15 24. A process according to claim 13 wherein the nucleophilic amine comprises monoethanolamine, the co-solvent comprises 1-methyl-2-pyrrolidinone, the compound of component (c) is ethylene glycol and the acid of component (b) is acetic acid.
- 20 25. A process according to claim 13 wherein the microelectronic substrate is a substrate for a flat panel display.
26. A process according to claim 25 wherein the substrate has an  
25 aluminum/neodymium layer.